Of Interest to Publishers

A Rational System for Measuring Composition

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Of Interest to Editors

This paper was written for the printer and the arguments advanced are from the printer's standpoint. It has always been our policy to enlighten our customers on such technical points which are of interest to those who publish, and a knowledge of which often proves of intrinsic value to those who are buying printing.

We believe that an understanding by the customer of the difficulties to be surmounted in the production of a high standard of book work will lead to a greater appreciation of the finished product, and a greater effort on his part to effect real coöperation with the printer.

This same subject will be presented within a short period, advancing the arguments from the publisher's standpoint. Keep this pamphlet until the second one reaches you, then re-read it after reading the second one, and we believe that you will understand that the real interests of both parties to a contract, are practically identical; that mutual confidence will lead to a degree of coöperation which will mean increased efficiency, bring a higher value in workmanship and service to the customer, and more uniform and probably somewhat better profits to the printer.

We have demonstrated to others that this is so and we are prepared to substantiate our claims to you.

THE WAVERLY PRESS,
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A RATIONAL SYSTEM FOR MEASURING COMPOSITION

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Speaking broadly, cost records are kept for two purposes: First, to be able to tell before a job is taken what price to charge to make a profit on it; second, to be able to tell after the job is delivered whether a profit was made—whether the estimate was right. *An estimate that is too low means the loss of money; an estimate that is too high means the loss of the job and the money that might have been made out of the job.*

Now the prime factor in estimating on anything, from putting carpets on floors to putting printing ink on paper, is determining the amount of work that must be done. A man who could not measure accurately would not long hold a job in a carpet store, where mighty little carpet is worth $5 a square yard.

Printers have been unable to estimate accurately the cost of composition, for there has been no accurate system of measuring composition, and yet there is mighty little composition that is not *worth more than $50 a square yard.*

The system, or rather complete lack of system, of using the em of the point size of the face to measure composition is ridiculous and comment would be superfluous but for the important fact that this method is universally used.

When composition is measured with the em of the point size of the face, no consideration whatever is given to whether the face used is fat or lean. Type faces of the same point size vary more in width than carpet does. How long would a carpet estimator last who assumed that all carpet was the same width, and in figuring the number of yards to cover a floor, paid no attention to the width of carpet for the job on which he was estimating?

A dollar represents the same amount of value whether you pay the dollar in quarters, dimes, nickels or pennies.

What does a thousand ems represent? Does a thousand ems of twelve point represent the same value (amount of work) as a thousand ems of six point? *Why, there is often a difference of more than 30 per cent in the value of two different thousand ems of the same point-size type.*

Here are three eight point faces:

abcdefghijklmnopqrstuvwxyz	{Length of lower case alphabet}	11.23 8 Pt. Ems.
abcdefghijklmnopqrstuvwxyz	{Length of lower case alphabet}	12.83 " "
abcdefghijklmnopqrstuvwxyz	{Length of lower case alphabet}	14.42 " "

The fattest of these faces will set almost 30 per cent faster than the leanest, and the operator of a composing machine when setting the fattest of these faces will produce 30 per cent more ems in the same time than when setting the leanest; *and this on setting identically the same matter—striking exactly the same keys.* And yet, in obtaining output records upon which to base estimates, how many printers give any consideration whatever to whether the faces used be fat or lean?

It is obvious that in selling printing, selecting the most profitable face for the job is of the utmost importance, and this is becoming more important as editions grow larger. In much work the saving in paper and press work effected by using a suitable condensed face and spacing closely adds a very handsome profit, while, when composition is sold by the page, the advantage of using a fat face and wide spacing should not be overlooked.

Whether, therefore, you charge composition to the completed job at a rate per hour, or a rate per thousand ems, you must know your average output per hour, based on a system of measurement that really means something, if your cost records are to be of any real value.

The prime object of a cost system is to enable you to sell at a profit—to give you the data to estimate accurately on new work. It is absurd to spend money on a cost system to get accurate hour costs, and then, in estimating, throw away all this advantage by figuring

on the totally false assumption that all kinds of matter, set in fat or lean faces, can be produced at the same average number of ems per hour. What can be more foolish than giving the buyer of printing, who says, "I do not care for quality and will not pay for it," more words to the page than your competitor does, unless by more closely setting the job you can make fewer pages and save paper and press work.

It is a fundamental principle of arithmetic that before any quantities are added to obtain an average they must be reduced first to the same denomination; you cannot add inches to feet and call the result either feet or inches; first you must express the quantities to be averaged in feet or in inches.

In the same way composition output records must be reduced to a common basis before they are averaged. Proper allowance must be made for whether the faces be fat or lean. How shall this allowance be made?

It is clear to all who have studied this question that the generally accepted standard for comparing faces, the length of lower-case alphabet, is too inaccurate to be of any real help in solving this problem. Indeed, in the old days of piece work on hand composition faces that looked fat by this standard but set skinny, because the most frequently used letters had been made condensed, were a constant source of irritation. If scientific management means scientific management, it is clear that any system of measurement to be acceptable today must take cognizance of something more definite than the alphabet length.

The monotype keyboard furnishes the ideal measuring instrument upon which to base an accurate system of measurement because this keyboard is both a measuring and adding machine. As each letter and space is struck its width is measured and recorded so that, after a line is set, the keyboard indicates exactly the number of ems in the line. To those not familiar with the monotype system the following will be of interest:

In using the keyboard the operator sets the measure not to the measure in pica ems as a compositor sets his stick, but to the equivalent, in picas, of this measure in ems of the "set" of the face to be composed. The conversion of pica ems to ems

of any set is quickly made by using a table calculated for all sets.

In the monotype system "set" is the measure of a face "linewise" and tells exactly how condensed or extended the face is. Referring to the three eight point alphabets, on page 2, the first, or most condensed, of these belongs to a seven-set monotype face; seven-set because the widest character used with this face is seven points wide. The second alphabet is eight-set, while the third, most extended, is nine-set. Thus, in composing matter seventeen picas wide in the most condensed of these faces, the monotype operator sets his keyboard measure to twenty-nine and one-sixth ems because his table for converting picas into ems of any set tells him that twenty-nine and one-sixth ems (widest characters) of this face is exactly seventeen picas wide.

The possibilities of using the "set" of a face as a basis for accurately measuring the amount of effort required to compose a required number of square inches of this face will be clear from the following specimens of monotype composition. Bear in mind that to use this same system of measurement for hand-set foundry type, or any other process of composition, we have only to first determine the "set" of the face we wish to measure accurately.

In the old system of measurement ("traditional" measurement) the amount of matter set is expressed in ems of the point size, the result of multiplying the measure in ems of the point size of the face by the number of lines set; the rational system of measurement gives the product in "Set Ems," that is, the measure *in ems of the set of the face* multiplied by the number of lines.

These specimens also show clearly the folly of measuring output with the em of the point size of the face as a "yard-stick" ("traditional" measurement), regardless of whether the face be fat or lean; because, with the exception of the quads required to finish the last line of the paragraph, the operator made the same effort, struck the same keys, in setting each specimen; the width in all cases is eighteen and one-half picas.[1]

[1] For the purpose of accuracy in these calculations, the fractions of the ems have been considered, but the usual habit should be followed in compiling statistics of not considering less than an em, dropping the fraction when less than one-half, and counting the next whole em when one-half or over.

The first specimen, figure 1, is set in a seven-set face, the keyboard measure is thirty and one-half ems six units ($\frac{1}{3}$ em); multi-

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8 pt. 1A (7 set) = 9 lines
Measure 18 picas (27 ems of 8 pt.); Traditional measurement = 243 ems
Measure 18 picas (30½ ems six units of 7 set); Set Ems measurement = 277½ ems

FIGURE 1.

plying this by the number of lines (9) gives 277½ *real ems*, of this face, or "Set Ems," the name for the output measured *in ems of the set of the face* in which the matter is composed. But according to tradition this amount of matter should be called 243 ems, because eighteen picas equals twenty-seven ems of eight point and the matter makes nine lines ($27 \times 9 = 243$).

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8 pt. 14A (8 set) = 10 lines
Same matter as Fig. 1
Measure 18 picas (27 ems of 8 pt.); Traditional measurement = 270 ems
Measure 18 picas (27 ems of 8 set); Set Ems measurement = 270 ems

FIGURE 2.

The next specimen, figure 2, is set in an eight-set face and measures 270 "Set Ems," also 270 point-size ems; the same number

of ems by both systems of measurement because an eight-set em is eight points wide.

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8 pt. 5A (9 set) = 11 lines
Same matter as Figs. 1 and 2
Measure 18 picas (27 ems of 8 pt.); Traditional measurement = 297 ems
Measure 18 picas (24 ems of 9 set); Set Ems measurement = 264 ems

FIGURE 3.

The third specimen, figure 3, is a nine-set face and, as shown beneath the specimen, this amount of matter is 264 "Set Ems," or 297 "traditional" ems.

Thus, if we use the "Set Ems" system of measurement the same words, the same number of key-strokes on a composing machine, make practically the same number of ems. But if we use the "traditional" measuring system, based on the point size of the face, the variation in measurement for the same amount of effort is as follows:

8 pt. 1A (7 set) = by Set Ems, 277½; by "tradition," 243 ems
8 pt. 14A (8 set) = by Set Ems, 270; by "tradition," 270 ems
8 pt. 5A (9 set) = by Set Ems, 264; by "tradition," 297 ems

Thus, by "Set Ems" measurement the maximum difference in measurements is thirteen and one-half ems, by "traditional" measurement the difference is fifty-four ems.

Before the "Set Ems" system of measurement can be used it is, of course, necessary to know the "set" of the face to be measured, in order to convert any measure in picas into ems of the set of the face by using the monotype table for changing pica ems to ems of any set.

The monotype specimen book gives the "set" of all monotype faces and we may determine the "set" of a type or slug face by matching it with a monotype face, the "set" of which is known. It is clear that if two faces set line for line on the same matter, in the same measure, they must be of the same "set" and that the same operator effort, the same number of key-strokes, will be required to compose the same number of "Set Ems" in either of these faces, whether the operator uses a monotype or a slug machine. Thus, the "set" of a type or slug face may be determined by composing in this face the same matter as is used in the monotype specimen book—"The best kind of originality is that which comes after a sound apprenticeship, etc."—and then finding from the monotype specimen book the "set" of the monotype face that runs line for line with this test specimen.[2]

The monotype keyboard may be used as a measuring machine to determine the "set" of any foundry or slug face; that is, to find from a printed specimen the "set" of the monotype face that will run line for line with this face, on the same matter in the same measure. The following explanation of this method for finding the "set" of a face is of interest, but it should be noted that once a face is measured and its set determined this work need never be repeated for that face.

To find the set of any face from a printed specimen, set ten full lines (no lines containing quads) on the monotype keyboard to determine the number of ems and fractions of an em (units) in each line. Of course fixed size spaces, not justifying spaces, of

[2] In determining the set of a face by comparison always refer to monotype Roman faces that are on Arrangement C. It is a simple matter on the monotype to combine in the same matrix case, and therefore to compose together, a condensed Roman and an extended Boldface because the Boldface matrices are placed in the matrix case in positions that produce much wider characters than the corresponding Roman letters. To facilitate making these combinations the Montoype Specimen book always gives, for faces not on Arrangement C, the set of the Roman face with which this Boldface will combine; that is, the set of the justifying scale to use in composing the Boldface shown—for example eight-point 11J, Arrangement C2, Boldface is listed as an eight and one-half set face. For the purposes of measurement this Boldface is in reality a nine and three-quarter set face because it will compose line for line with a nine and three-quarter set Roman face on Arrangement C.

the same width as the spaces in the printed specimen must be used. From the number of ems and units in each of these ten test lines obtain the average number of ems and units per line. Measure the width of the specimen in picas with a type rule. In monotype system, a face that has its widest character one pica wide is twelve set; therefore, by simple proportion, the old rule of three of arithmetic, we can find the set of the face tested on the keyboard because we have (*a*) the average number of ems and units per line, (*b*) the measure in picas, (*c*) twelve, the set of a face that would give as many ems to the line as the measure in picas. We can express this relation as follows:

$$\text{Set of face tested on keyboard} = \frac{\text{Measure in picas} \times 12}{\text{Number of ems to the line}}$$

Suppose that the average number of ems to the line of the face tested was twenty-three and that the matter tested was seventeen and one-half picas wide. Then the set of this face would be 9.13, or nine and one-quarter set; the table for changing pica ems to ems of any set gives the difference in faces by quarter sets.[3]

$$\frac{17\frac{1}{2} \times 12}{23} \times \frac{210}{23} = 9.13$$

In thus determining the set of faces it is essential to take into account the necessary wide spacing of slug machine faces. In monotype composition, as in hand work, the spaces between words are proportional to the size of the face. In slug faces the same size spaces are used with all faces and consequently the spaces in six-point slug composition are twice as wide as in hand composition. Therefore in using the keyboard to determine the set of a hand-set face use six-unit spaces between the words of the test lines set on the keyboard; for a slug face use twelve-unit spaces.

To be fair to yourself, to be just to your operators, if you keep your records in "Set Ems" never talk about your ems per hour or compare your records with those kept in the "traditional" way until

[3] For those who have not access to a keyboard the Monotype Company will determine the set of any face, twelve point and smaller, without charge, upon receipt of a page of composition in this face.

you have first converted your "Set Ems" into the "traditional" ems of the point size. To do this increase your output statements by not less than 20 per cent. This is essential in comparing foundry type and monotype records with slug machine output because few, if any, slug machine faces are so condensed that their "set" is equal to their point size and also because of the necessary wide spacing of these faces.

By using "Set Ems" in estimating you automatically make proper allowance for fat and lean faces. A job is to be set in eight point, twenty-one picas wide, sixty lines to the page. If a nine-set face be used each page will make 1680 "Set Ems," for the table for changing pica ems to ems of any set shows that twenty-one picas equals twenty-eight ems of nine-set ($28 \times 60 = 1680$). If your records show that your composing machines average 3600 "Set Ems" per hour (60 "Set Ems" per minute) the time required for this page will be twenty-eight minutes ($1680 \div 60 = 28$). If, instead of a nine-set you use an eight-set face there will be 1890 "Set Ems" per page (21 picas = $31\frac{1}{2}$ ems of eight-set: $31\frac{1}{2} \times 60 = 1890$) and thirty-one and one-half minutes will be required to set a page ($1890 \div 60 = 31\frac{1}{2}$). Thus, your price on the eight-set face should be 12.5 per cent higher than on the nine-set if your composing machines maintain the same rate of profit.

But by far the greatest advantage of keeping output records in "Set Ems" is that it keeps constantly before you the profit—or loss—in type faces. It almost forces you to furnish the face that will give you the greatest profit on the job you are estimating on. If the edition be large you make an additional profit by saving on paper and press work, selecting a suitable condensed face and setting it close spaced. If the composition is sold by the page you use as fat a face as possible and make sure that it is wide spaced. In short, if you are in competition you furnish no more words to the square inch than your competitor does unless you get paid an extra price for furnishing an article that costs more to produce.


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